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Bridging the US/India Nuclear Non-Proliferation Divide: The Way Ahead

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Abstract

The agreement signed between President Bush and Prime Minister Manmohan Singh on July 18, 2005, will transform US policy towards India. For its part, India is committed to reinforcing its long-held stand on cooperation with the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), acceding to intrusive voluntary inspections and working towards a fissile material production moratorium. This paper lays down a practical blueprint. The steps that the US would take involve three broad directions: (1) Washington would intervene with international organizations to further India's energy and import needs. (2) US laws would be addressed that now prevent expanding technical, nuclear, and trade cooperation with India. (3) The US would promote Indian participation in non-proliferation efforts outside the NPT. A corollary of the third initiative would be to encourage Indian participation in international nuclear technological research initiatives.

Simultaneously, India would begin by updating its 1962 Atomic Energy Act and putting greater effort into stabilizing the nuclear situation in South Asia. The Act would be rewritten to regulate the activities being done by the Indian Department of Atomic Energy. Two supplementary activities would be carried out: (1) a phased separation of the civilian and weapon programs, with the nonmilitary portion becoming an independent commercial activity under majority government equity, and (2) capping of the fissile material stocks once the programs are separated. The separated civilian program would be offered for international safeguards. India will also agree to tighten a whole set of laws dealing with nuclear materials and their possible export.

Abbreviations and Acronyms

AERB	Atomic Energy Regulatory Board (India)
AP	Additional Protocol (to an IAEA Safeguards Agreement)
CBM	Confidence Building Measure
COSC	Chief of Staff Committee (India)
DAE	Department of Atomic Energy (India)
DGFT	Directorate General of Foreign Trade (India)
DoD	Department of Defense (US)
DOE	Department of Energy (US)
DUPIC	Direct Use of Spent Fuel in CANDU Reactors
EAA	Export Administration Act (US)
EU	European Union
FMCT	Fissile Material Cut Off Treaty
GDP	Gross Domestic Product
GTRI	Global Threat Reduction Initiative (DOE)
IAEA	International Atomic Energy Agency
IDSA	Institute of Defence Studies and Analysis (India)
INFCIRC	Information Circular (IAEA official document)
ITER	International Thermonuclear Experimental Reactor
MOD	Minister of Defense (India)
MOX	Mixed Oxide (fuel)
MTCR	Missile Technology Control Regime
MWe	Megawatt (electric)
NAC	New Agenda Coalition
NAM	Non-Aligned Movement
NNSA	National Nuclear Security Administration (US)
NNWS	(NPT signatory) Non-Nuclear Weapons States
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NRC	Nuclear Regulatory Commission (US)
NSA	National Security Adviser (India)
NSG	Nuclear Suppliers Group
NSSP	Next Steps to Strategic Partnership
NPCIL	Nuclear Power Corporation of India Limited
NWS	Nuclear Weapons State (party to the NPT)
PSI	Proliferation Security Initiative
PHWR	Pressurized Heavy Water Reactor
RevCon	(NPT) Review Conference
SCOMET	Special chemicals, organisms, materials, equipment, and technologies
UN	United Nations
WMD	Weapons of Mass Destruction

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Executive Summary

The agreement signed between President Bush and Prime Minister Manmohan Singh on July 18, 2005, seeks major alterations in US policy towards India, in return for which India is committed to reinforcing its long-held stand on cooperation with the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), acceding to intrusive voluntary inspections and working towards a fissile material production moratorium. The Agreement is going forward despite some domestic opposition in both countries.

For the US and India, the Agreement is the near culmination of their common strategic perceptions and the convergence of national vital interests. The convergence of interests makes the Agreement an extraordinarily unusual one. What was specifically agreed to therein is far less than what is generally promised; that is, a joint journey for both countries at the end of which both politics and international law will be satisfied. Politics demands that relations between the two largest democracies be completely normalized, and international law demands that the NPT not be breached in the attempt to satisfy politics. This report lays down a practical blueprint to satisfy both.

This report enumerates and amplifies the steps that the US would take under four broad headings. (1) The US would promote Indian participation in non-proliferation efforts that run outside the NPT, such as the Proliferation Security Initiative (PSI) and the Nuclear Suppliers Group (NSG). (2) US laws would be addressed that now prevent expanding technical, nuclear, and trade cooperation with India. These include the Nuclear Nonproliferation Act of 1978, the State Department Technology Alert List, and the Export Administration Act. (3) The US would expand commercial nuclear cooperation, including fuel supply for the Tarapur reactors and US Nuclear Regulatory Commission (NRC) cooperation with the Indian Atomic Energy Regulatory Board (AERB). (4) Washington would intervene with international organizations to further India's energy and import needs. A corollary of the fourth initiative would be to encourage Indian participation in international nuclear technological research initiatives, thereby reinforcing the US belief in the absence of any other motive to India's unusual nuclear fuel cycle.

Simultaneously, the report outlines how India would begin by updating its Atomic Energy Act of 1962 to regulate the activities that are actually being done by the Indian Department of Atomic Energy. India would put greater effort in stabilizing the nuclear situation in South Asia. Supplementary activities by India could be divided into two categories: (1) a phased separation of the civilian and weapon programs, with the nonmilitary portion becoming an independent commercial activity under majority government equity and (2) capping of the fissile material stocks once the programs are separated. The separated civilian program would be offered for international safeguards. The only portion outside these two areas—the non-weapon military

activity of naval reactor production, fueling, and fuel manufacture would be declared, but not offered for inspections. India would agree to tighten a whole set of laws dealing with nuclear materials and the possible export of weapons usable material. To enforce some rigor into domestic rules and regulations, Indian rules would be strengthened to abide by International Atomic Energy Agency (IAEA) Information Circular (INFCIRC) 225 for secure storage and transport of non-weapon material and would also codify rules on military nuclear material. Comparisons have shown that India's new export control laws and banned lists are harmonized with the NSG guidelines, while some work may still have to be done on the Missile Technology Control Regime (MTCR) guidelines. India will step up its direct dealings with the IAEA to assist in non-NPT initiatives, such as training personnel from other countries and locating "orphaned" radiological devices.

Lastly, the report concludes with the view that managing the promises will require interagency coordination of organizations on both sides that should deal directly with each other.

1. Introduction/Objectives

This study was written against a backdrop of strategic perceptions related to the US/India Joint Statement, issued on July 18, 2005 (Appendix A). The Joint Statement, signed by the President of the United States and the Prime Minister of India, addresses five major issues related to US/India relations. The issue that has attracted the world's attention is nuclear non-proliferation. The Joint Statement attempts to close the non-proliferation chasm that has separated both countries for some thirty years. The Joint Statement marks only the beginning of the journey, and it may be at least five years before it is complete. There are many who see fearsome obstacles on the way. International regimes stand unchanged, and non-proliferation mechanisms run autonomously. These practical obstacles are addressed in depth in Section 1 of this paper.

Sections 2 and 3 review the progress that the US and India have made in the last two decades towards developing a mutually beneficial relationship. They describe the aspirations and disappointments of both countries in the way they view each other. There is much that both countries can do together on the world stage if the differences on non-proliferation can be resolved without creating nuclear anarchy or weakening the non-proliferation institutions that the US has so assiduously built up over four decades. India is asking for an opportunity to demonstrate its support for non-proliferation, which is enshrined in a treaty that India could not sign 37 years ago. However, the world today is different, and these differences are articulated.

Section 4 lists and amplifies the actions the US must consider to fulfill the promises made in the July 2005 Agreement. Some of these actions involve reviewing and possibly revising domestic laws, or their interpretation, and others involve influencing allies to act or interpret the situation favorably for India. The US must initiate other actions, both domestic and international, to enable India to become a player in non-proliferation. The demands on India are no less challenging, and these are set out in Section 5. Regardless of its position regarding the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), India must take steps to permit international inspections of an intrusive nature, create laws and regulations that will be models of compliance with international expectations, and cooperate in international efforts to stem proliferation. Both countries are democracies with vocal domestic oppositions. Accommodating dissent is an equally formidable task. The study shows how the framework the two leaders signed on July 18, 2005 can be implemented.

Section 6 looks at the problems in both countries associated with interagency execution of complex agreements and suggests the creation of adequate mechanisms.

1.1 Political Agreement of July 18, 2005

The nuclear divide between the US and India has endured for almost three decades and soured what could have been a productive and synergistic relationship. The Joint Statement between US President George W. Bush and India's Prime Minister Manmohan Singh, signed on July 18, 2005, attempts to bring to an end the series of spiraling consequences of India's nuclear tests in 1974 and 1998. In addition, the Joint Statement will impact the actions of the US Congress, the US administration, the US Nuclear Regulatory Commission (NRC), and international bodies including the Nuclear Suppliers Group (NSG) and the International Atomic Energy Agency (IAEA). This far-reaching agreement clearly requires that India and the US take a broad range of

actions through several agencies and channels to accomplish the objectives.[1] The US, whose actions are limited by a number of domestic laws and international agreements, has promised to work with Congress to amend these laws and/or seek congressional approval, if necessary, to accommodate India. It has also committed to work with "friends and allies to adjust international regimes"—a clear reference to the NSG, whose guidelines currently prevent India from acquiring civilian nuclear reactors from the international market.

The leaders have committed the two countries to a process that must clearly identify the channels through which actions will be taken. India promises to convert from being a nonparticipant, skeptical of the NPT, to a more prominent role with a commitment to support international non-proliferation efforts. Concurrently, India must (1) transition from autonomy to following IAEA rules and safeguards voluntarily; (2) separate its civilian and military nuclear programs; and (3) take government positions that comply with international regulatory organizations.

Announcement of the Agreement initiated debates in both countries, particularly with respect to its benefits for each country. The response in both countries has generally been favorable, as has been that of the IAEA Secretary General. A detailed evaluation of the benefits and limits relative to each country is beyond the scope of this paper, which focuses on the steps required by both the US and India to successfully implement the Agreement.

1.2 NPT Review Conference 2005

The 2005 Review Conference (RevCon) for the NPT concluded its deliberations on May 27, 2005. The President of the Conference, Sergio Duarte of Brazil, said that very little had been accomplished. Agreement on the agenda could not be reached prior to the conference. There were no votes on issues related to the NPT at the conference. Prior to the RevCon, states had coalesced into various groups. These groups included the Nuclear Weapons State (NWS) parties to the NPT; the Non-Aligned Movement (NAM), represented by Malaysia; the New Agenda Coalition (NAC), represented by New Zealand; and Egypt, acting as an independent country. In addition, there are the states that have not signed the NPT (India, Pakistan, and Israel).

The NWS parties to the NPT unanimously supported the Treaty[2] as a "critical tool in the global struggle against proliferation" (US), and as having "played an important role in…diminishing nuclear peril" (China). Russia called it "the most representative international agreement in the security sphere;" France said that "our principal safeguard remains the recourse…to determined action and effective multilateralism;" and the UK urged "the treaty's objectives to be sustained and their implementation strengthened." The NAM, however, expressed resentment with the continued possession of large numbers of nuclear weapons by the NWS, stressed the dangers of vertical proliferation, and cited the breach of the grand bargain of eliminating nuclear weapons in an indefinitely extended NPT. The NAC stood in the middle, stressing the equal importance of the three pillars of the NPT (non-proliferation, disarmament, and the free flow of technology) and the need to address them.

The NPT clearly faces challenges to its continued viability. The world of 2005 is not the world of 1968 when the NPT opened for signature. The NPT was designed primarily to regulate governments, whereas many of the threats today appear to have shifted to nonstate actors and to signatory states that now seek to breach it in secret. In the first case, the auditing of governments

is obviously not the answer, and in the second, auditing governments on the information provided by those same governments is pointless.

The US remains firmly convinced that steps must be taken beyond the existing NPT. The argument between those who advocate non-proliferation and those who advocate disarmament is not seen as an active issue by the US government. US domestic pressure to disarm disappeared after 9/11. In a 2004 interview, Assistant Secretary of State John Wolf articulated the US stance on non-proliferation.[3] One could infer that the following actions are necessary to bolster compliance with the NPT:

- Persuade Iran to end "non-compliance"
- Force North Korea to accept verifiable, irreversible disarmament
- Strengthen the IAEA's budget on safeguards
- Curtail the spread of nuclear enrichment and reprocessing technologies
- Adopt the Additional Protocol (AP) as the new safeguards standard
- The NSG should deny technology to those who have not yet signed an AP agreement
- Influence countries to raise their national non-proliferation mechanisms to comply with UN Security Council Resolution 1540

How then should the NPT be enforced? The expression most commonly heard was, with a "new pragmatism."[4] What are the outlines of this new pragmatism? The 13 steps[5] for disarmament developed at the 2000 RevCon seem impracticable. For India and Pakistan, as states with nuclear weapons, to sign the NPT as nonnuclear weapon states is just as impracticable. The best new "Grand Bargain" for the next decade may be for India and Pakistan, joined by Israel, to strengthen the nonproliferation regime from outside of the NPT.[6]

2. US Perceptions on Politics, the Future of the NPT, and India

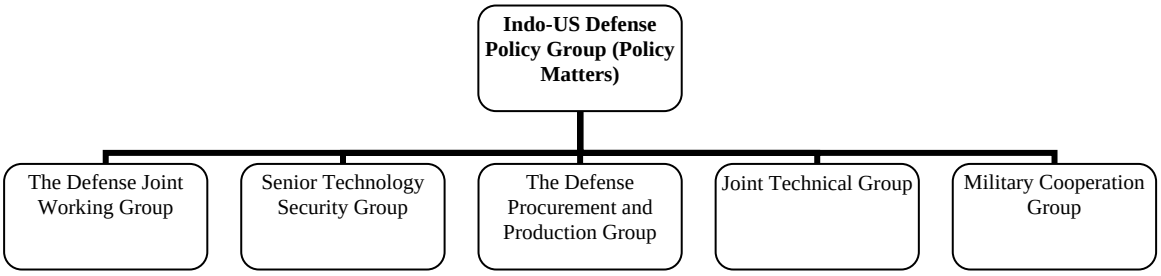
The positive aspects of the US-India relationship run along four major channels. There is a military-to-military relationship, the strategic relationship between the two governments, public perception (consisting of the majority opinion of the Indian and American peoples), as well as a trade and economic channel which runs largely outside government control, but is influenced by the two capitals.

2.1 Military-to-Military Relationship

The National Security Strategy of the United States of America, September 2002 says, "The United States has undertaken a transformation in its bilateral relationship with India based on a conviction that US interests require a strong relationship with India."[7] This quote is more true today than when it was written. A defense framework was signed on June 28, 2005, between US Secretary of Defense Donald Rumsfeld and India's Defence Minister Pranab Mukherji.[8] The agreement noted, "The U.S.-India defense relationship…seeks to advance shared security interests. These interests include…preventing the spread of weapons of mass destruction and associated materials, data and technologies." The implementation of the clauses is contained in paragraph 4E, entitled "enhance capabilities to combat the proliferation of weapons of mass

destruction." The Indo-US Defense Policy Group, defined by the agreement, is structured as shown in Table 1.

Table 1. Structure of the Indo-US Defense Framework



2.2 Strategic Relationship

From an indifferent strategic relationship, there are today joint working groups on defense, space, intelligence, and high technology. There is an Indo-US Joint Business Council. Direct relationships exist between the US National Aeronautics and Space Administration and the Indian Space Research Organisation, and exchanges continue between the US Nuclear Regulatory Commission and the Indian Atomic Energy Review Board. Confirmation of the US government's need to engage India is also cited in the US National Intelligence Council's Global Trends,[9] which predicts that India will be at least a Regional Power by 2020, given current rates of growth. During these years of growth, the US could become the power most interested in seeing the success of India's democratic government.

2.3 Surveys of Public Perception

A Chicago Council of Foreign Relations[10] public opinion poll revealed that between 1998 and 2002, the percentage of Americans who believe the US has a vital stake in India increased from 36% to 65%, and those Americans who believe India will play a major role in the next ten years increased from 26% to 40%. The Indians reciprocate even more startlingly, according to the Pew Research Center's Global Attitudes Project. According to this poll, most of India's people see the US as the land of greatest opportunity.

2.4 Commercial and Economic Relationship

The US is India's largest trading partner, with bilateral trade reaching $20 billion and a surplus in India's favor. Government representatives who participate in the "US-Indian Economic Dialogue" are aware that this part of the relationship is managed by the private sector. India has much to gain from the entry of US firms into India, from financial and pension fund companies to agro business firms and high technology industries, such as aerospace, biotechnology, and pharmaceuticals. Opportunities for American businesses are extensive. For example, India will order approximately 350 passenger aircraft, valued at $26 to $30 billion, in the next ten years.

If the horizon looks rosy, what is the problem? To a large extent, the problem arises out of perceptions in the minds of US companies as to how far they can engage with India when embargoes still exist.

The problems in the US-India relationship arose from the 1994 Glenn Amendment to the US Arms Export Control Act. The Glenn Amendment requires that the US respond to the Indian nuclear tests with seven steps that are almost automatic in their application to India and Pakistan. These seven steps are:

(1) suspend foreign aid,
(2) terminate military sales and all military assistance,
(3) stop credits or guarantees from US government agencies,
(4) vote against credits to that country in the International Monetary Fund (IMF),
(5) vote against credits by International Financial Institutions,
(6) prohibit US banks from making loans to that government, and
(7) apply the Export Administration Act 1979 on dual-use technology exports.

A study on the efficacy of the sanctions on India shows that the threat of the sanctions probably delayed the nuclear tests.[11] The effects of the sanctions were catastrophic in the case of Pakistan, which had a need for quickly disbursed lending from international lenders. The marginal effects on a mainly autarkic economy like India's were noticeable only between May and July 1998. However, indices such as the foreign currency reserves, the stock market index, the levels of foreign investment, and the Global Depository Receipts (GDR) premium had fully recovered by January 1999. Sanctions had no coercive effect on India to force non-proliferation measures, but they did succeed in complicating the politics between the two countries.

2.5 Progress to Date

The US undertook several initiatives to transform the US/India relationship. These included:

- Attempted to compress the time to execute the Next Steps to Strategic Partnership (NSSP), first announced by President Bush in June 2004
- Cleared Lockheed Martin to offer the F-16 to India and cleared Boeing to offer the F-18 to India as its new multi-role fighter
- Opened dialogue on new areas such as command and control, early warning, and missile defense

Ashley Tellis, a Senior Associate with the Carnegie Endowment for International Peace and previously an advisor to former US Ambassador to India Robert Blackwell, has recommended further steps that the US government should take:[12]

- Obtain India's commitment to take part in the Proliferation Security Initiative (PSI) as a core member
- Provide financial support to President Bush's Democracy Fund
- Obtain India's commitment to Iraq's stabilization attempts in the nonmilitary area
- Include India in the International Thermonuclear Experimental Reactor (ITER) project

2.6 The Indian Fuel Cycle

Development of the Indian nuclear program has been described as having three stages, as originally envisioned by Dr. Homi Jehangir Bhabha. The three stages involve transitioning from

Pressurized Heavy Water Reactors (PHWRs) to fast reactors and eventually to thorium reactors, since thorium is the only nuclear fuel locally available.[13] This program "essentially links the fuel cycles of each stage in a manner that multiplies the potential of nuclear fuel several hundred folds."[14]

India's nuclear fuel cycle is a source of some doubt and disbelief in the US, mainly because the US adopted a "once through" fuel cycle, for reasons rooted in the history of American nuclear research. The Indian attempt to create a closed-loop fuel cycle with vastly reduced waste management requirements may thus create doubts on the issues of technical validity, costs, and time delays. Such doubts may even necessitate that the Indian nuclear power program be augmented by the purchase of proven-technology light water reactors so that the energy target of 20 gigawatts by 2020 is achieved.

While this skepticism plays no role in the bilateral negotiation process and is not an issue in specific legal disputes, there are many technologically oriented people in the US who believe that the Indian program could be a façade for an unchecked plutonium manufacturing process leading to a weapons buildup. Although a detailed examination of the year-by-year performance of India's PHWR-based civilian power reactor program would show that vast amounts of hidden plutonium in India are a myth, the insinuations and accusations continue without any substance. Added to the fears of India accumulating plutonium is the apprehension that India's thorium could be used to make weapon grade ^{233}U. There is little doubt that many who drive the non-proliferation lobby in the US cling to the theory that behind the apparent power-generation aspirations of the Department of Atomic Energy (DAE) in India is actually an ambitious weapons program or a weapons program integrated with the civil power program.

The apparent disbelief is an issue that should be clarified between the scientific communities in the two countries. It can be resolved only through scientific exchanges, which today are limited in the field of nuclear science due to the sanctions.

3. Indian Perceptions on National Vital Interests, the NPT, and the US

3.1 US Support with Energy Security

Every perceptive Indian who lived through the humiliating years of the currency-exchange limitations believes that the country has progressed dramatically or is about to do so. The standard of living is visibly better, the poverty levels have come down, and there are rising expectations that cannot be ignored. Accompanying the rise in prosperity are shortages of utilities, infrastructure, and consumer goods. Of these, the shortages in electricity have become large enough to create a political problem in many states. The rate of growth of the Indian gross domestic product (GDP) went from 4.4% in 2000–2001 to 8.1% in 2003–2004. Powering the expected rate of growth of 8% GDP in the coming decade is a constant 5% rise in energy demand and consumption, among the highest in the world.[15] The absolute usage of the primary energy sources, during various decades, is shown in Table 2.

Table 2. Indian Usage of Fuel Sources (in absolute amounts) [16]

Source	1970	1990	2002	Units
Coal	80.5	229.6	387.0	million tonnes
Oil	19.5	57.9	111.3	million tonnes
Gas	0.5	12.5	28.7	billion cubic meters
Nuclear	1.3	6.4	19.3	terawatt hours
Hydroelectric	30.4	66.4	68.5	terawatt hours

Oil as an energy source has peaked and may well begin to decline in absolute amounts. Hydropower usage has begun to decline because of uncertain rainfall and pressure from agriculturists for the premature release of water from reservoirs. Gas usage has shown the highest rate of growth, followed by nuclear power. During the same period, India's recoverable reserves of oil remained static at 5.6 thousand million barrels, while the cost per barrel of oil has doubled. The uncertain future of India's access to oil and gas is contained in the union government's Hydrocarbon Vision Statement.[17] The share of coal in the energy mix is also predicted to decline from 55% to 50%, while the share of nuclear energy will grow from 2% to 3%. The installed capacity of nuclear power is expected to grow from 2.770 gigawatts in 2005 to 10 gigawatts by 2010, and 20 gigawatts by 2020. In addition, the recent split in the giant Indian multinational conglomerate, the Reliance Group, led the new companies to branch out into joint-sector nuclear power engineering as part of a ten-year, $20 billion investment.[18]

Today India has fourteen operating nuclear power reactors, while nine are under construction, possibly the largest number under construction anywhere in the world. Appendix B lists the current and planned nuclear power reactors in India. The existing power reactors are built and run by the Nuclear Power Corporation of India Limited (NPCIL), while the latest power reactor, the 500 Mwe fast breeder at Kalpakkam, will be run by the separately constituted Bhartiya Nabkhiya Vidyut Nigam (*Bhavini*). There are six research reactors—two are used in the weapons program and four contribute to India's indigenous nuclear power generation program. One reactor experiments with mixed oxide (MOX) fuel, one is a pure research reactor, one experiments with thorium fuel, and another is a small version of the thorium experimental reactor. The research activity supports the Indian three-stage nuclear power generation program.

There is some opposition within the Indian nuclear power program to adopting US technology and equipment. For example, A. Gopalakrishnan, the former chairman of India's Atomic Energy Regulatory Board (AERB) has suggested that US assistance be confined to influencing the NSG to make a one-time exception to supply enough uranium fuel for the lifetime of 5000 MWe of PHWR power plants.[19] A neutral observer, however, finds gaps in the DAE reports of its performance: financial analyses omit the cost of capital, and plant performance has been patchy—except for the recent successes of Kakrapar and Narora 2. The success of Indian nuclear scientists so far has been technical rather than commercial. The indigenous three-stage fuel cycle may eventually be an operational success, but between 2005 and 2020 only large-scale enriched uranium reactors will meet India's energy target. This school of thought concludes that it is now time to follow the example of the US and France and switch over to large light water reactors of

proven technology, making whatever political adjustments are necessary to win over the US and hence the NSG.

3.2 US Support with International Organizations

Political considerations demand that India, with an impeccable non-proliferation record and a strong democratic tradition, be assisted to become a more influential power. However, US-India relations are complicated by the constraints on the NSG to enforce the "Trigger List" of goods that cannot be exported to India, because of the policy of sanctioning India over nuclear testing.[20] There is a way over the legal hurdles. For example, Israel and Pakistan have communicated their export control laws to the IAEA, which has republished them as INFCIRC 632 and 636 respectively. Both countries obviously intend to look upon themselves as "unilateral NSG adherents."[21] India feels that a US-India strategic relationship would be less useful if Washington cannot use its considerable influence on the NSG to offer nuclear reactor technology to India.

From the Indian viewpoint, the problem is urgent, as the Tarapur Atomic Power Station is due for refueling in 2006. These two reactors, supplied by the US, were under IAEA safeguards in a trilateral agreement. The US walked out of this agreement in 1974. Tarapur needed refueling in late 2000, and the fuel was instead supplied by Russia, a move "regretted" by the US State Department.[22] Tarapur earlier received low enriched fuel from China in 1995 and possibly from France for an earlier refueling in 1985, which the Reagan administration supported. These reactors are still under IAEA safeguards and have played no role in India's weapons program. The Joint Agreement of July 18, 2005 indicates that the US is willing to agree to supply Tarapur with fuel.

3.3 The Indian Vision

The perceptions of India concerning non-proliferation are best summed up in the speech of the External Affairs Minister at the conference on "Emerging Nuclear Proliferation Challenges" organized by the Institute of Defence Studies and Analysis (IDSA) and Pugwash-India on March 28, 2005, in New Delhi.[23] The salient features of the speech are the following:

- The NPT regime is coming under increasing strain because of its failure to prevent clandestine proliferation.
- India has an abiding interest in non-proliferation and was one of the initiators of the proposal for an agreement to prevent proliferation (which became the NPT).
- India may not be a member of the NPT, but its record related to NPT Article I and Article III has been impeccable. Regarding Article VI, it is the only weapon state ready to commence discussions on a Nuclear Weapons Convention.
- India has a No-First-Use policy and a declared moratorium on nuclear testing.
- The international community needs to evaluate the existing framework and evolve a new one to curb proliferation, yet permit legitimate cooperation in peaceful uses of nuclear energy.
- India has violated no international law and is committed to strengthening the regulatory framework, in keeping with technical challenges.
- India's progress needs a clean and cheap source of energy, and Indian prosperity is being held hostage to restrictive technology denial regimes.

4. US Actions to Bridge the Divide

4.1 Fuel for the Tarapur Reactor

India's first two nuclear power reactors (boiling water reactors) were supplied by US companies (General Electric Corp. with Bechtel Corp. as the architect engineers). They began operation in October 1969, with an assured supply of low enriched uranium nuclear fuel for 30 years for both reactors. However, US fuel was cut off in 1974 following India's first nuclear test. These reactors have completed more than 30 years of operation using Russian, French, and Chinese fuel under IAEA safeguards. A number of cycles have also tested MOX fuel. As a consequence, the Indian establishment seems sanguine that with refueling due in 2006, the Tarapur facilities could run either on commercially-supplied fuel, as before, or on MOX.[24]

There is little doubt that India will refuel these power reactors and run them for the Maharashtra state electricity grid, a system already beset with shortages that led to riots in early 2005. However, it would make little sense for India to effect an agreement with China for nuclear fuel or to run the plant with MOX, with its attendant fissile material production problems, when the General Electric plant was supplied by the US. These two reactors were run with US fuel when the supply of nuclear materials was governed by the tripartite (US, India, and the IAEA) INFCIRC 154. Although the original agreement expired on October 24, 1993,[25] India offered to continue safeguards voluntarily. The Board of Governors of the IAEA agreed; the bilateral agreement INFCIRC 433 was issued in May 1994.[26]

4.2 Utility of INFCIRC 66 in US-India Relations

The NPT was designed to enable the IAEA to maintain safeguards on peaceful nuclear activities, but it is important to note that the IAEA and its safeguards system is older than the NPT. The IAEA became operational in 1957. INFCIRC 66 describes "project-type" safeguards,[27] which existed before the NPT. In 1970, when the NPT came into force, the IAEA was appointed the agency responsible for ensuring that states comply with the treaty. After the treaty came into force, the non-nuclear weapon states (NNWS) were to submit all of their nuclear activities to INFCIRC 153 safeguards, which would ensure that nuclear materials are not diverted to nuclear weapons. At that stage, states not party to the NPT, either as weapon or nonweapons states, had recourse only to INFCIRC 66 as a model under which supplier states could transfer nuclear technology.

The discovery of clandestine nuclear activity in Iraq and North Korea in the early 1990's led to the view that the IAEA's verification procedures needed to be upgraded. This upgrading included rigorous accounting of nuclear material, installation of surveillance equipment, and random inspections. All these measures were incorporated into the new model agreement called INFCIRC 540, "Model Protocol Additional to the Agreement(s) Between State(s) and the International Atomic Energy Agency for the Application of Safeguards." The application of this more vigorous regime requires additional legal authority, which can come only from a separately negotiated bilateral agreement—an Additional Protocol (AP)—between the state and the IAEA.[28] Interestingly, INFCIRC 540 is not applicable to nuclear weapons states, but is the basis for negotiating proposals of new "voluntary offers" made by them. The original NWS voluntary offer agreements predate INFCIRC 540. There are clearly three categories of states as far as the

IAEA is concerned: the NWS with the right to make voluntary offers, the NNWS (some of which have not concluded an AP), and the three states of India, Pakistan, and Israel, which are states with INFCIRC 66 agreements.

A strongly held view in India is that INFCIRC 66 should have led to the flow of civilian nuclear technology to India, as with the Tarapur reactors, on which additional trilateral agreements were signed. Later, in 1988, an intergovernmental agreement was signed between India and the Former Soviet Union for the supply of two 1000 MWe pressurized light water reactors under IAEA safeguards. Indian views here essentially mirror US views—that the world in 2005 is not the world of 1975 (a year after India's first nuclear explosion). Since 1975, the Indian record in non-proliferation has been exemplary, and national legislation has been strengthened. The US should re-examine the use of INFCIRC 66 as it pertains to India.

4.3 Proliferation Security Initiative

In many ways, the Proliferation Security Initiative (PSI) is a classic new initiative that goes beyond the NPT to prevent proliferation. After the PSI was first announced in 2003, India balked at participating. In retrospect, joining the PSI would have been just the kind of step that India needs to take to become more widely accepted as a state possessing nuclear weapons. India's temporary refusal to join seems almost self-defeating. It is widely accepted that New Delhi might have been persuaded to join if it had been named a core group member.[29] There is some significance in being a core member, as core members have the sole power to make crucial decisions. India's role in the Indian Ocean region is so predominant that it is inconceivable how the PSI could operate in the region without India's participation, unless the US Navy would be expected to perform all the PSI responsibilities on its own. [30]

The PSI arose at a bad time and was perceived negatively in India before knowledgeable maritime experts could take a closer look at how it would be implemented. The old legal justification for boarding ships on the high seas was confined to preventing mutiny, slavery, and piracy. These subjects were the issues of their time, just as Weapons of Mass Destruction (WMD) are the subject of our time, and Article 1540 is the international framework for appropriate national legislation. Unfortunately, the PSI surfaced when the world press was locked in criticizing unilateral US actions in Iraq. Too many observers concluded that the PSI was intended to contravene international laws. In fact, boarding and interdiction in territorial waters are established precedents, while a ship perpetually on the high seas is of no relevance. There is no legal anomaly in the PSI's Statement of Interdiction Principles of September 2003 that India need fear.

Many countries have apprehensions similar to India's, and the Indonesian and Malaysian withdrawal from the Regional Maritime Security Initiative is a forerunner of similar problems. Since the PSI began to be enforced, there have been at least eleven successful efforts in which shipments were intercepted, including those containing ballistic missile components.[31] While this may be a substantial effort in terms of numbers, the largest consignment of missile parts intercepted was by the Indians (while outside the PSI) when the North Korean vessel, the *Kuwolsan*, transporting missile parts to Pakistan, was detained in the port of Kandla.

Setting aside legal and diplomatic problems, the PSI has many functions to perform in certain areas of the globe. The PSI is actively required in the West Pacific, the South China Sea, and the

Indian Ocean. It would therefore make much more sense to restructure the PSI to enable participation by crucial countries like India regionally. From India's viewpoint, a more mature and constructive view has developed as presented at the IDSA-Pugwash conference on March 28, 2005, in New Delhi. A framework of international regimes in 2005 will clearly be different from that of 1968. It is interesting to note that the ideas for restructuring the UN have addressed the roles of states like India, which are not signatories to the NPT. Those ideas recommend that such states be asked to give their pledge to support non-proliferation and disarmament initiatives as well as to support the Comprehensive Nuclear Test Ban Treaty (CTBT) and the Fissile Material Cut Off Treaty (FMCT). If India is to play a larger role in the PSI, it would make sense to renegotiate India's accession as a core member.

4.4 Assisting with the NSG

For Indians, the fact that the NSG, with its demand for full-scope safeguards, and the IAEA, with safeguards under INFCIRC 66, can co-exist is a mystery and source of some cynicism. The NSG prevents India from receiving nuclear technologies and fuel, while INFCIRC 66 was designed specifically to permit the spread of civilian nuclear technology to countries like India. The NSG has published its guidelines for the Export of Nuclear Material Equipment and Technology as an INFCIRC 254 revision.[32] It is surprising that the capability of many of the countries in the group to manufacture most of the equipment and machinery according to their own guidelines is considerably less than India's. Indeed, looking at the list of countries and the scope of the guidelines, it seems that if the NSG was intended to prevent nuclear proliferation, doing so without India, Pakistan, and Israel in the suppliers list is like lifting water in a sieve. Now that China is an NSG member (despite allegations of nuclear proliferation), it is clear that the group intends to be practical in its approach to non-proliferation.

From the NSG's point of view, India falls under the definition of a non-nuclear weapon state, although the legal basis for such an assumption is doubtful because India is not a signatory to the NPT. In 2001, the NSG decided to conduct an outreach effort to engage the non-NPT states. To their credit, the non-NPT states have passed domestic legislation to conform to NSG guidelines, although there has been no benefit for them, so far. Russia proposed in 2000 that non-NPT signatories join the NSG as associate members, while France suggested that being tough on low enriched uranium reactor technology makes little sense if such transfers are under safeguards and export control regulations exist.[33] India has continued to maintain a relationship with the NSG, in the hope that nuclear exports without the full-scope safeguards requirement might become possible, as recommended by President Bush in the NSSP.

An NSG delegation visited India and Pakistan in April 2005. The impression in New Delhi is that Russia and France would be delighted to sell civilian nuclear reactors to India, as would the US. However, such a concession, according to the NSG rules, would also attract the commercial interests of countries like Japan, which have fuel cycles more closely resembling what India needs. It is doubtful that the NSG would make an effort to find a way out of its own full-scope safeguards box without a US initiative from within the group.

4.5 Support of the Nuclear Regulatory Commission

Officially, the US NRC is not involved in making nuclear policy, particularly in the international arena. However, since 2003, the NRC and its Indian equivalent, the AERB, have been meeting regularly. These meetings were unpublicized, except for the latest one in February 2005. After

the 2005 meeting, the NRC Commissioners met a number of writers and analysts and stated that the visits had gone off "extremely well" and that the NRC had been impressed with what the AERB has been doing. During the 2005 visit, the NRC had been shown the Dhruva reactor, the source of India's weapons plutonium, as well as the research and development facilities at Bhabha Atomic Research Center (BARC), the two boiling water reactors supplied by the US in Tarapur, and the PHWRs at Kota.[34]

The NRC has no overriding say in the extent of US nuclear cooperation with India, but without the NRC's favorable report, nuclear cooperation would likely not have been launched. In that respect, a political or policy movement should follow from the expanding ties between the NRC and the AERB. The crucial role of the NRC becomes evident when one reads the necessity of the NRC's "all clear" in making up the crucial Nuclear Proliferation Assessment Statement, required for international nuclear cooperation as stipulated in Section 123 of the (amended) US Atomic Energy Act of 1954.

4.6 India's Participation in Radkowsky Reactor. DUPIC and ITER Projects

The Radkowsky reactor,[35] which would use thorium as the fuel core, would theoretically reduce electricity costs by 20% to 30% and produce no waste products that could easily be converted into weapon material. The world has more thorium than uranium, but this reactor is being developed only by collaboration between the US and Russia, for reasons which have not been published. It would appear reasonable to assume that the Indian experience in trying to move to a thorium cycle would make Indian scientists ideal partners in a world initiative to build a proliferation-resistant reactor. It appears that most of the experimental work was performed in the US and Russia on naval propulsion reactors, which may not be a coincidence, since Radkowsky was employed in the Naval Propulsion Laboratory for many years. However, many of the advantages of the Radkowsky approach, like non-proliferation, lower costs, minimal waste, etc., are the same advantages declared for the Indian fuel cycle.

Similarly, the Direct Use of Spent Fuel in CANDU Reactors (DUPIC) is a research collaboration between the Republic of Korea, Canada, and the US. The purpose of the project is to refabricate spent PHWR fuel into CANDU reactor fuel, thereby reducing uranium requirements as well as the accumulation of spent fuel. In this process, no separation of plutonium is involved. Both the Radkowsky and DUPIC initiatives are not IAEA projects, and India's expertise is considerable in both areas. It would be constructive if the US were to declare that Indian participation would not be considered a breach of any current non-proliferation laws.

The International Thermonuclear Experimental Reactor (ITER) initiative began in 1972, with the participation of the European Union (EU), Japan, the Russian Federation, and the US. (Later, Canada became associated with the EU, and Kazakhstan with Russia.) The design discussions went on until 1999, when they were frozen and the parameters were broadly fixed.

There were reports in June 2005 that the reactor would be built in France. At the same time, India has been conducting its own plasma experiments, according to the DAE. One of the world's first superconducting steady-state tokamaks is nearing completion at the Institute of Plasma Research, in Gandhinagar, Gujarat. In this instance, it would also be valuable for the project to include India in the core group. From the Indian point of view, involvement in advanced fusion research would greatly help the NSG and the NAC to accept the legitimacy of India's position as a

supporter of non-proliferation and a net contributor to advanced nuclear technology for peaceful purposes.

4.7 Addressing US Laws

US-Indian relations are hampered by a set of laws:

- Atomic Energy Act of 1954 (as amended by the Nuclear Non-Proliferation Act of 1978, NNPA) Chapter 11 – International Activities
- Technology Alert Update of 1 August 2002
- Export Administration Act 1979

The Atomic Energy Act has some important clauses governing cooperation with other nations on nuclear matters, notably Section 123.[36] India seems to clear most of the hurdles set up in Section 123, which specifies many conditions that a state must fulfill to be a recipient of US nuclear civilian technology.

Section 123 also contains a critical piece of information to explain the processes that the US government can use to authorize transfers. For a transfer to take place, a classified and unclassified version of a Nuclear Proliferation Assessment Statement (NPAS) must be issued—the unclassified version by the Secretary of State and the classified version with the help of experts from the Central Intelligence Agency, the Department of State, the Department of Energy, and the Nuclear Regulatory Commission. The President has to authorize the transfer and verify that the supply will not threaten the security of the US. Then the President must submit it to the Committee on Foreign Relations of the Senate and the Committee on Foreign Affairs of the House of Representatives, each for not less than 60 days of continuous session. During this period, Congress will consult with all the parties who made the assessment before giving its concurrence. Interestingly, the Secretary of State may address the Congress on whether such transfer will help the cause of non-proliferation and "encourage the recipient nation to adhere to the treaty," and whether failure to grant the license would be "prejudicial to the non-proliferation objectives of the United States." If Congress rejects it, the President can still authorize the transfer if he determines that withholding it would jeopardize the common defense and security.

The difficulty perhaps comes with Sections 126 to 129, which state that no nuclear technology can be transferred if a *non-nuclear weapons state* detonates a weapon after the act came into force, or terminated or abrogated an IAEA agreement. There are some other clauses that forbid transfer such as to states that violate agreements with the US or to states that transfer nuclear technology or material to another state. This last clause is interesting for it immediately raises the antecedents of the transfer of Westinghouse reactors to China, which transferred nuclear technology and materials to Pakistan after the act came into force. The legal interpretation that enabled the Chinese transfer could perhaps be extended to India as well.

The second act that affects trade relations between the two countries is the US State Department's Technology Alert List of 2002, which updates an earlier list. It could be assumed that this list is not of cardinal significance, as it largely focuses on not granting visas to persons who might be involved in misappropriating sensitive technology, WMD proliferation, or coming from terrorist-sponsoring states.

The third act is the Export Administration Act (EAA) 1979, as amended by the EAA 2003,[37] which has not yet been passed. All countries are listed in tables in supplement No.1, Part 738, in the US Commerce Control List Overview and the Country Chart. The countries have been assessed for their possible standing on the Chemical and Biological Weapons Conventions; on nuclear non-proliferation; on the effects that country's policies have on US national security; on the effects of its policies on regional stability; and on its anti-terrorism attitudes. However, no sensitive results are produced, and India is only a point above Libya and a point below China. It is understood that the new act now before Congress will permit a more sensitive ordering of states by the President.

India is a functioning democracy with no proliferation cases against it, while Pakistan is accused of major proliferation violations as well as harboring large anti-US lobbies. There is virtually no difference between India and Libya in the Country Chart, which is surprising. While China has aroused proliferation concerns due to its export policies as late as 2004, it is still more successful conducting high-technology trade with the US than with India. As stated earlier, however, this is not the problem, but a symptom of the problem; the earlier chasm between India and the US is related to the NPT. Although the NPT does not arise in day-to-day activities between the two countries, the issue prevents what could be a dynamic relationship in every other way.

The application of the EAA has created the greatest amount of controversy regarding mutual intentions, because of the many levels at which requests from India for certain imports can be turned down, despite the attempts made at the highest levels to change the political climate. From the US side, the best clarification of US intentions has come from the Under Secretary of Commerce, Kenneth Juster, in a speech to the Indian Chamber of Commerce and Industry in November 2003, in New Delhi. Juster reiterated that the Bush administration is determined to "complete the process of qualitatively transforming US-Indian relations in pursuit of their many common goals." [38] The fear in India has been that high technology would be denied to Indians as an act of coercion to change Indian goals after the nuclear tests. Juster has stated that sensitive dual-use goods are controlled, no matter what country is involved, and that trade with India would be governed by the 14 "principles." These 14 principles are gathered into four categories: (1) the role of the private sector, (2) lowered tariff barriers by India, (3) increased access to US durable goods, and (4) the importance of non-proliferation measures.

Juster states categorically that "sanctions do not apply to India" and that the vast numbers of dual-use items do not require licenses. Most applications received from within the US by the Department of Commerce are returned as being unnecessary, and the number of licenses processed increases every year. Approximately 16% of applications are denied. Some advanced technology entities in India give a different picture; they say that because they expect not to be successful, they don't even apply.

High-technology, big-ticket items are mainly imported by Indian government companies, primarily in defense and aerospace. The Indian government procedure is invariably to invite world tenders: US companies have rarely tendered. The most surprising exception is the permission recently given to Lockheed and Boeing by the US government to tender the F-16 and F-18, respectively. If these or equivalent platforms are acquired by India on licensed manufacture with components made in India, the dual-use question would eventually be set at

rest. The Indian view is that in a world where the flow of information is difficult to monitor, attempts to deny technology serve no political purpose other than to create hostility.

5. Indian Actions to Bridge the Divide

5.1 Rewriting the Indian Atomic Energy Act 1962

Many of India's problems with international nuclear regulatory bodies began with its failure to write an honest and comprehensive Atomic Energy Act, or to amend the existing one so that the act did not become a dead and useless document, neither regulating nuclear activity nor keeping current with the DAE. A review of the Act[39] shows that it is rooted in the late 1950s when the entry of the department into the atomic energy field was guarded as a government prerogative, with no provision for private players. Over the years, Indian nuclear activity has taken on an independent life, unattached to legislative action, responsibility, or any connection between what the laws say and what the department is doing.

An analysis of the thirty-two clauses of the Act reveals that eight pertain to preserving the government monopoly on the extraction and processing of radioactive materials. Additional clauses prevent private-party litigation in acquiring that monopoly, and five elaborate the penalties for breaking the monopoly law.

The Indian government established itself as a monopoly in passing this legislation. The Act is all power and no responsibility. It is particularly disturbing that no amendment has been made since the country began overt weaponization in 1998, and that the Act was only meant to secure a government monopoly on atomic energy for generating electricity. From 1998 to 2005, the Act remained unaltered and did not address the responsibility for making, storing, and accounting for fissile materials and fully assembled explosive devices. From this uneasiness arise more doubts. Since the Act was written, DAE activities have become so diverse that only the DAE itself could even begin to document the activities that currently need to be legislated. If the Act has not been touched for 45 years, senior officials outside the department must realize that the DAE may now prefer to operate permanently in an unlegislated manner.

This again raises the question whether any new legislation can be left to the DAE to recommend, or whether there be an independent commission to write new legislation. Will the accounting of fissile material and nuclear devices continue to be left unlegislated with no offences and penalties stipulated that are applicable to those who have had custody of them? Major questions arise, not because of the absence of legislation, but because activities that affect public interest and public safety were left unlegislated for so many years.

The agreement of July 18, 2005, only touched on the broad responsibilities of the Indian side on meeting non-proliferation objectives. The state of legislation on nuclear activities is a public matter in India, and reform must begin with a new act that speaks of responsibility, a word that does not appear anywhere in the Act. The AERB might have been entrusted with auditing the writing of the new act if it had been established by legislative action, which it was not.

5.2 Stabilizing the Nuclear Situation in South Asia[*]

The idea that South Asia is a nuclear flashpoint pervades the political thinking of many countries. In the US, where the State Department and the Pentagon are well briefed, this is not a departmental view, but vestigial fears still exist. In any case, a common security objective for India and Pakistan is to leave threats of a nuclear war behind them on their road to rapprochement and peace. Achieving this objective would undoubtedly lead to a more relaxed atmosphere in the way that South Asian security objectives are looked at in Washington, Moscow, or Paris. *Stabilization* is a word that has crept into the lexicon of arms control experts and generally describes a situation in which both *crisis stability* and *arms control stability* have been addressed. Crisis stability refers to the steps taken by two countries with a hostile relationship to reduce the chances of an accidental or deliberate nuclear war as a result of misperception in the course of frequent crises. Arms control stability refers to the successful efforts of two countries to prevent arms races and to prevent escalation dominance or achieving first-strike capability.[40] Achieving crisis stability is usually a prelude to arms race stability. These efforts have generally run on for two to five years of continuous negotiations. If these historical lessons are indicative, the efforts made by India and Pakistan in the ongoing Composite Dialogue "Peace and Security including confidence building measures" Working Group would seem to be petty and half-hearted.

Frequent nuclear crises in South Asia would clearly threaten efforts to bridge the nuclear divide between the US and India. Both India and Pakistan need to put more effort into their attempts to get to nuclear stability. The record in these attempts is, as stated earlier, discouraging.[41] For instance, it took more than a year to achieve the recent agreement on notification of missile flights. Since the beginning of the two-year composite dialogue, the record of what has been achieved is considerably less than that of the Lahore Agreement,[42] when eight nuclear CBMs were agreed to in one forenoon. The Lahore Agreement went into limbo with the Kargil conflict, but the status of achievements of nuclear CBMs in 2005 is probably behind what was achieved at Lahore in 1999.

The Indian view is that Pakistani negotiators have been briefed to go slowly so that not much progress is made in any of the conflict resolution talks until the Kashmir talks progress. The political strategy behind this is that Islamabad does not mind South Asia being described as a nuclear flashpoint, for it draws international attention to the Kashmir dispute, which India believes is a bilateral affair. The problem with this approach is that the crisis stability talks may go on for five years, thereby delaying for a decade the commencement of the arms control stability talks.

For India, the overall objective is to achieve nuclear stability with Pakistan and China. China's intentions are as yet unclear. Until 2003, the Indian consensual view was that China intended to tie India down south of the Himalayas by using Pakistan as an ally. The recent success of the China-India talks indicates that the strategic perception in Beijing may have changed in favor of accommodating Indian strategic interests. India does not seek nuclear parity with China, but would benefit from the opening of a nuclear dialogue with Beijing—a request that Beijing has

[*] The author was involved in the Indian military and has experience with nuclear Confidence Building Measures in both the official (Track one) and unofficial (Track two) capacities. Most of the views here expressed are a result of more than more than 14 meetings with Pakistani counterparts, many of them in a semi-official (Track "one and a half") setting.

not as yet accommodated. Pakistani observers have often stated in bilateral talks with the Indians that they are looking for a nuclear balance, not parity.

The strategic background in South Asia already exists for a settlement in which Pakistan is prepared to live in a nuclear quantitative asymmetry with India, which is equally prepared for a quantitative asymmetry with China. However, procedure and past experience show that the India-Pakistan talks concerning confidence building measures (CBMs), which should have been a mere way station on the way to arms control talks, are holding hostage far more important settlements. There is a huge volume of literature available in the presses of both India and Pakistan indicating the peoples' unhappiness with the conduct of the India-Pakistan nuclear CBM talks. Failure to progress in these talks will eventually lead to great uncertainty in the minds of the strategic planners in India and Pakistan. This will, in turn, have a cascading effect on efforts to stop fissile material production and approach an FMCT, as promised by the Prime Minister of India and President Bush (in the Joint Statement of July 18, 2005).

5.3 Working Towards a Fissile Material Cutoff

The best non-proliferation measure will always be a voluntary one in which a state declares a self-imposed policy of producing no more fissile material. When such a step is taken without conflict with national security interests, there will be little need for a rigorous external audit and inspection system. The Indian Prime Minister has agreed to a phased separation of the country's civilian and weapons programs, and a voluntary offer to the IAEA to permit inspection of the civilian facilities. This might well be preferred by the international community, but these measures fall short of a voluntary self-imposed fissile material cut-off, a prospect examined below.

Such a step in India is probably held up by the absence of a clear indication by the Indian strategic community to the scientists on how much is enough. With arms control talks nowhere on the horizon, it will be difficult to decide on an arsenal size initially with Pakistan and later on with China. It is conceivable that the unused fissile material stocks currently available in the country could produce an arsenal of varying size to satisfy the needs of deterrence with Pakistan. A similar assessment is difficult to make vis-à-vis China owing to the absence of an Indian assessment of the Chinese arsenal and China's own views on a fissile material cutoff. China's official position at the Committee on Disarmament in Geneva is that it supports a fissile material cutoff convention. Reportedly, US experts believe that China is no longer producing fissile material.[43] Nevertheless, China refused to sign a fissile material production moratorium, and it is inferred that Chinese options remain open pending a US and Russian decision on downsizing their arsenals further and a US decision on ballistic missile defense.

Much of the world's and India's decision on a fissile material moratorium will depend on some accurate estimates of Chinese fissile material stocks. Once the Indian strategic command makes its own calculations, it could arrive at its own figure and instruct the scientific community to work towards a moratorium. However, mechanisms in India still do not exist to deal with issues such as arsenal sizes, although the scientific community may have its own views. However, it is not unreasonable to assume that following the phased separation of India's civilian and weapon programs, it would be possible for India to suspend fissile material production as a voluntary moratorium. Formalizing the moratorium in a convention would depend on other factors.

5.4 Strengthening Indian Export Control and Harmonizing with the NSG and MTCR

In May 2005, the Indian parliament passed The Weapons of Mass Destruction and their Delivery Systems (Prohibition of Unlawful Activities) Bill, 2005.[44] The bill is a milestone in the history of Indian foreign relations, as it marks the first time a law was passed domestically to meet international standards of non-proliferation. Much time went into both the preparation of the bill and the support of the bill with expanded lists of nonexportable items. It should be read in conjunction with the revised SCOMET (special chemicals, organisms, materials, equipment, and technologies) list published by the Director General, Foreign Trade, in the Ministry of Commerce. The list was revised on July 15, 2005, when both the biological agents list and the nuclear materials list were brought up to date.[45]

The Indian Prime Minister determined in the July agreement that India will harmonize the bill in accordance with the NSG and the Missile Technology Control Regime (MTCR). Neither the NSG nor the MTCR includes India as a member. The first problem in implementing the bill is that it was introduced in the Lok Sabha (Lower House) by the MEA, which has no power to enforce or execute a bill of this kind, once passed. The second is that the author is aware that the Directorate General of Foreign Trade (DGFT) has a philosophical conflict with implementing the SCOMET because the purpose of the DGFT is to promote foreign trade. Implementing restrictions on trade is antithetical to the culture of the organization.

There would be two ways to implement the provisions of this bill—the first way is preventive, in which exporters are made aware of the bill and made to declare what they are exporting. Exporters would be informed of the penalties for exporting items on the SCOMET list. This would be the primary approach, without actually inspecting the goods. The second is to carry out random inspections at random ports, which would be the duty of the customs, which operates under the chairman, Central Board of Direct Taxes, who is under the Ministry of Finance. Should it become necessary to check that an export has an SCOMET exclusion certificate, this inspection would be performed by customs officials. There is, therefore, a need to educate and train customs personnel and equip them to detect a breach of the rules (e.g., the smuggling of radioactive substances, biological agents, and chemicals). It would be wise to enter into an agreement with government organizations in the US to train Indian Customs on ways to implement the nonexport section of the SCOMET list.

Whether the SCOMET list harmonizes with the NSG and the MTCR lists is an interesting question. The NSG guidelines are published under INFCIRC 254 and have been referred to earlier. For comparison, the term *uranium enrichment equipment* has been chosen, to see how it is addressed on both lists. The NSG list on this subject specifies items in detail, such as (Section 3.A.2) “tunable pulsed single-mode dye laser oscillators…operating at wavelengths between 300 and 800 nm.”[46] The Indian SCOMET list [47] also lists under Category 4A “tunable pulsed single-mode dye laser oscillators…operating at wavelengths between 300 and 800 nm.” Similarly, the Indian list (in the section describing equipment, assemblies, and components) proscribes crucibles having “a volume of between 150 cm^3 (150 ml) and 8000 cm^3 (8 liters);” the exact wording of the crucible description found in the NSG list.

It seems therefore that the harmonization between the NSG guidelines and the SCOMET list had already been achieved after the SCOMET list was amended on July 15, 2005. It would be interesting to observe whether this harmonization has been appreciated and will facilitate

bringing India into the NSG. How would the IAEA acknowledge the harmonization of the two lists? Would it add India to the list of countries from which *Notes Verbale* were received, and publish a corresponding revision to INFCIRC 254?

There are some discrepancies between the SCOMET list and the MTCR guidelines.[48] It is possible that the SCOMET list leaves out machines that do not exist in India. However, harmonizing these two lists is a task for the future, provided that India understands the processes and procedures of becoming part of the MTCR.

5.5 Securing Nuclear Material in India by Applying IAEA INFCIRC 225 and US DoD Regulations

If India is eventually to work at separating the civil and military programs, there must be separately monitored security programs in the civil and military establishments. The AERB obviously cannot be accountable to inspect military installations. The Convention on Physical Protection of Nuclear Material of 1980[49] and the IAEA guidelines for physical protection[50] are limited to fissile materials "for peaceful purposes in international transport." These two conventions are not mandatory in India as physical protection standards for military-use fissile materials. There are thus no standards for protection in the host country where they were manufactured and stored. International conventions do not come close to US domestic standards.[51]

INFCIRC 225 recommends the securing of nuclear material throughout a country (including storage, transportation, movement, and accounting). In applying it within India, all organizations dealing with nuclear ordnance or material are made to look upon nuclear material with a sense of responsibility that goes beyond the handling of conventional explosives or ordnance. INFCIRC 225 should be studied in conjunction with INFCIRC 274, which is the convention on the physical protection of nuclear material. The objectives of INFCIRC 225 are well written—"To provide a set of recommendations on requirements for the physical protection of nuclear material in use and storage and during transport and of nuclear facilities. The recommendations are provided for consideration by the competent authorities…"[52] It makes it mandatory to identify the competent authorities, an action that certainly falls short of achievement in India and could easily be corrected.

It is informative to review the nuclear protection directives of US agencies (the Department of Energy, DOE; the Department of Defense, DoD; and the US Air Force) and what their Indian counterparts should have produced. Lists of selected directives issued by these authorities are presented in Tables 3, 4, and 5. Recommendations are in the last two columns. Admittedly, the stocks and movements of nuclear material in the US are much larger then what can be envisaged in India. However, India must develop regulations modeled on the US directives that would be appropriate for its own nuclear situation.

Clearly, some of the documents mentioned in the three tables are critical to the immediate future. An analysis of DOE 5610.14 makes it clear that nuclear material transportation runs through clearly specified chains of command at every level.[53] Explicit instructions and delineation of responsibilities of this nature would be critical for the safe movement of nuclear material across India. Without such a document, the movement of nuclear material would be a random and haphazard occurrence.

Similarly, the DoD Nuclear Weapons Transportation Manual (DoDM 4540.5-M) is clearly of interest to the Indian Minister of Defense (MOD) in writing a formal manual of the same kind. While many of the specific actions may be relevant only to the US, the subjects of the paragraph headings in this document are eminently worthy of study and application to India. Just as the US documents of this nature are unclassified, so should the Indian instructions also be unclassified, while the actual orders for a specific move may be classified.

Table 3. Department of Energy Documents Implementing IAEA INFCIRC 225

http://www.fas.org/nuke/guide/usa/doctrine/doe/index.html

Document Number	Topic	To Be Developed in India by	Remarks on Implementation
DOE G452.2a	Safety of Nuclear Explosive Operations	DAE and DRDO leaving authority to DAE	Certified by AERB within one year
DOE 5530.2	Nuclear Emergency Search Team (NEST)	DAE and Chairman Joint Chief of Staff. Led by DAE	Certified by the National Security Adviser (NSA) within one year
DOE 5610.10 through 14	Nuclear Explosive and Weapon Safety Program: including Safety, Packaging, Offsite Transportation, Security and Control Transportation Safeguards System Program Operations	DAE, Defence & Home Secretary led by DAE	Certified by NSA within one year
DOE 5630.11 through 17	Safeguards and Security Program including Inspection, Evaluation, Agreements, Planning, Training, Performance Test and Standardization	DAE, Chief of Integrated Staff, MOD	Certified by the Chairman of the Chief of Staff Committee (COSC) within one year
DOE 5632.7a	Protective Force Program	DAE and Commandant, Central Industrial Security Force (CISF)	Certified by AERB within one year
DOE 5633.3 b	Control and Accountability of Nuclear Materials	DAE. Ordnance not held by services	Certified by COSC within one year

Table 4. Department of Defense Nuclear Doctrine

http://www.fas.org/nuke/guide/usa/doctrine/dod/index.html

Document Number	Topic	To Be Developed in India by	Remarks on Implementation
Joint Pub 3-12	Doctrine for Joint Nuclear Operations	Chief of Integrated Staff & Strategic Force Commander, led by CISC	Inspected by COSC within six months
DoDD 3150.1	Joint Nuclear Weapons Development Studies and Engineering	Chairman Joint Training Committee	Inspected by Chairman within one year
DoDD 3150.6	US Nuclear Command and Control System Support Staff	Chief of Integrated Staff	Inspected by NSA with one year
DoDD 4540.5	Movement of Nuclear Weapons by Noncombat Delivery Vehicles	DAE and Defence Secretary	Inspected by NSA within one year
DoDM 4540.5-M	Nuclear Weapons Transportation Manual	Army, Navy and Air Force Chiefs in coordination with DAE	Inspected by AERB within one year
DoD 5100.52-M	Nuclear Weapon Accident Response Procedures		
DoDD 5210.42	Nuclear Weapon Personnel Reliability Program	DAE for its personnel, CISC for service personnel	COSC for service personnel within one year

Table 5. Air Force Special Weapons Doctrine

http://www.fas.org/nuke/guide/usa/doctrine/usaf/index.html

Document Number	Topic	To Be Developed in India by	Remarks on Implementation
AFI 91-1 /101/102/103	Nuclear Weapons and Systems Surety including Safety Studies, Operational Safety Reviews, Safety Rules, Safety Certification Program	Air Chief and DAE led by Air Chief	Inspection by NSA after one year
AFI 91-108	Nuclear Weapons Intrinsic Radiation Safety Program	Air Chief and DAE led by Air Chief	Inspected by COSC after one year
AFI 91-114	Safety Rules for Ballistic Missile Weapon Systems	Army Chief and DAE led by DAE	Inspected by NSA after one year
AFI 91-111	Safety Rules for US Strategic Bombers	Air Chief and DAE led by Air Chief	Inspected by COSC
AFI 191-116	Safety Rules for Storage of Nuclear Weapons	Air Chief and DAE led by DAE	Inspected by NSA after one year
AFI 91-115	Safety Rules for Nuclear Logistics Transport by the Prime Nuclear Airlift Force	Air Chief and DAE led by DAE	Inspected by AERB within one year
AFI 91-117	Safety Rules for the Airborne Launch Control System	Air Chief	

5.6 Separating the Civilian and Military Programs in a Phased Manner

A country having been in the same developmental stage as India would have progressively built a common nuclear program for reasons of cost and economy. India also has a unique fuel cycle based on PHWRs indigenously designed and built, running in parallel with two light water reactors supplied from the US and two Russian light water, pressurized water reactors at Koodankulam (KK1 and KK2). The last site has assured reactor fuel, guaranteed from Russia, for the life of the reactors. Ten more reactors will be built, of which eight are indigenous PHWRs and two are Russian reactors similar to the KK1 and KK2. All these reactors are under the control of the NPCIL, a public sector company with annual reports that show power generated and efficiency ratios. It would appear therefore that the DAE was probably moving in the direction of a phased offer of placing power reactors under open safeguards, in any case. All the Russian reactors and the two American reactors are already under IAEA safeguards. Removing the entire inventory of power reactors belonging to NPCIL from the weapons program should not take long and could be considered in the first phase of the separation process.

Since these reactors are not of the once-through variety, the upstream and downstream facilities would be closely connected and interlink weapon and civilian facilities. However, here again, the new reprocessing facilities being constructed at Trombay and Kalpakkam are due to overtake the facilities at BARC, which would give the DAE the option of separating the reprocessing facilities between military and civilian. Until this is done, it would be impossible to guarantee that the power reactors are not getting fuel from facilities that may have been used for the weapons program, or that reprocessing facilities for the power reactors may have supplied fuel for the weapons program. Even though the net supply and intake of fuels for the power reactors may be balanced overall, inspectors would not agree to “clubbing” reprocessing facilities. This obviously would not be a problem if India had achieved satisfaction with fissile materials and they were not currently in production. However, it is too early to assume in any phased program and will be dealt with later.

Certainly, the size of the reprocessing facilities at Kalpakkam, the Fast Reactor Fuel Reprocessing Plant (FRFRP), and the Kalpakkam Atomic Reprocessing Plant (KARP) would enable the DAE to allocate these two to the power program and to retain the reprocessing facility in BARC in the weapons program, thereby geographically separating the weapons and civilian reprocessing facilities. The uranium enrichment facilities should not be a problem if India discloses the nuclear submarine project and declares it a weapons site not offered for inspection.

Intrusive inspections of sites offered for inspection may possibly reveal fissile materials above the permissible limits, if that facility was formerly a joint civilian and weapons facility. This should not be a problem because India is not hiding anything, and an explanation should be offered on how the material came to be there.

5.7 Declaring the Indian Nuclear Submarine Program and the Supporting Nuclear Facilities Under Traditional Safeguards

It is widely known that India has been developing a nuclear submarine over the last two decades. Officially, there is no acknowledgement that the program exists. The program requires enriching uranium, which can be mistaken internationally. However, since India’s plutonium production was apparent to foreign intelligence in the mid-eighties, it would have made better sense to declare the purpose of the uranium enrichment as unconnected with nuclear weapon production

so as to prevent misunderstanding. It is possible that the reluctance to disclose any details came from the Russian side, which collaborated in some aspects.

Circumstances today are different. When voluntary offers are being discussed, it is pertinent that even INFCIRC 153 supports the inclusion of military nuclear facilities not associated with nuclear weapons. The state, however, has to "inform the agency, making it clear that the use of the nuclear material in a non-prescribed activity will not be in conflict with an undertaking the state may have given" and further that the "non-application of safeguards" will not result in "the production of nuclear weapons or other explosive devices."[54]

Although highly enriched naval reactor fuel might be used to produce an inefficient nuclear weapon, India obviously has no intention of starting such uranium weapon production. However, declaring a naval reactor as a military nonexplosive facility, which is permitted, is hardly possible without declaring a nuclear submarine program. One must precede the other to be credible, and the Indian state needs therefore to work this out with the Russians and declare the project as a prelude to claiming exemption under paragraph 14 of INFCIRC 153. Conversely, declaring the reactor facility without declaring the project would make the declaration "in conflict with an understanding the state may have given."

5.8 Assisting the IAEA

Despite being a non-NPT state, India has traditionally enjoyed a constructive relationship with the IAEA, and an Indian representative sits on the board. In February 2005, for instance, India, the US, and the IAEA agreed to cooperate in the field of locating orphaned radiological devices. The agreement was put together in India by representatives of the DOE and IAEA, who expressed satisfaction at the offer made by India to conduct regular international courses on the safety of radiological sources.[55] The Indian offer extended to locating, consolidating, and disposing of high-risk, orphaned sources by a system of natural and regional repositories. The Indian offer is seen as a positive step in the DOE's Global Threat Reduction Initiative (GTRI) and is part of the National Nuclear Security Administration (NNSA) project to form regional centers with countries such as India, Australia, Brazil, and Argentina for the same purpose. Nevertheless, India's relationship with the IAEA was extremely limited because IAEA's top positions were not open to Indians, the Department of Safeguards was out of bounds to the Indian representative, and Indian scientists were not asked to participate in inspections.[56] With the voluntary offers being made by India, the IAEA-India relationship will change and allow India the level of participation that the Director General of the IAEA seems to support.[57]

6. Conclusions

The world's non-proliferation regime in 2005 must be fundamentally different from that of 1968. The Cold War is over, but the risks from nuclear weapons could result in three possible outcomes:

(1) Deliberate nuclear use as well as accidental, inadvertent, or unauthorized use is reduced through international conventions.
(2) The presence of nuclear weapons over time will induce technologically capable NNWS to breach the NPT.
(3) Existing stocks of nuclear material will leak out to non-state actors or proliferator states.

In 1968, the IAEA depended solely on voluntary transparency by states to monitor the NPT. Because the levels of transparency offered by many states have improved, it is now possible to more accurately analyze conditions in which a state is in violation of its alleged official nuclear fuel cycle. Other national technical means also enable some states to check the movements of nuclear material, particularly those that are unannounced and unexplained.

The new 2005 strategy must be cognizant of the most relevant state-to-state deterrence process in the world, which is in South Asia. The growing strength and increasing role of India in the South Asia region demands that the US make an attempt to include India, rather than excluding it from international conventions. Indian participation in non-proliferation has been voluntarily and enthusiastically offered by the Prime Minister of India. The US, in return, has offered to apply its influence on its allies and to amend its laws so as to raise the US-India relationship to a genuinely strategic level.

This paper outlines the steps that both governments should take to accomplish their joint nuclear non-proliferation objectives. Table 6 shows a possible schedule for the implementation initiatives that would be necessary to accomplish the objectives.

The promises made by India are unique. They are those of a de facto nuclear weapon state that has sworn to openly and visibly separate its weapon program from its civilian program and essentially to cap its fissile material production. It has simultaneously committed to opening its entire civilian program to intrusive inspections, as well as to signing the Additional Protocol. When all these measures are instituted, a new benchmark for public behavior will be established for a de facto weapon state. A similar offer by all weapon states could eventually prove to be the new grand bargain that might strengthen the Treaty on the Non-Proliferation of Nuclear Weapons.

Table 6. A Possible Schedule of Implementation

Peripheral Measures Suitable for Unilateral Declarations (September – December 2005)

- Dismantling of PSI core group by US (done)
- Indian announcement of commitment to PSI
- US assistance to introduce India to the ITER and Radkowsky projects
- Public acceptance of Indian safety standards by the NRC.
- Indian commitment to becoming a regional player for GTRI and similar NNSA programs
- Indian declaration of willingness to "harmonize" with NSG Guidelines

Core Measures Possible at Presidential Visit to India (Winter 2005)

- US supply of Fuel for Tarapur under
  - INFCIRC 66 Rev 2
  - Transfer of fuel to India through IAEA
- US offer and Indian acceptance of associate membership on NSG
- Indian announcement of Phase 1 of separation of civilian & nuclear programs. Phase 1 consisting of all power plants under NPCIL and nuclear fuels complex at Hyderabad. Timetable announced for safeguards of Phase 1 facilities
- Indian announcement of nuclear submarine building program and supporting infrastructure of "Declared Nuclear Military Non-Weapon Facilities"
- Indian announcement of all measures recommended in this paper to implement INFCIRC 225.
- Indian announcement of inter-agency group to rewrite Atomic Energy Act 1962
- US announcement of amending clauses of EAA79 that affects India

Balance Measures Pending After Presidential Visit

- An India-Pakistan realistic timetable for nuclear CBM talks
- An Indian timetable for total separation of civilian and military facilities
- A US announcement of methodology of addressing US law amendments

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Appendices

Appendix A. US/India Joint Statement of July 18, 2005

http://www.indianembassy.org/press_release/2005/July/21.htm

the White House
President George W. Bush

For Immediate Release
Office of the Press Secretary
July 18, 2005

Joint Statement Between President George W. Bush and Prime Minister Manmohan Singh

Prime Minister Manmohan Singh and President Bush today declare their resolve to transform the relationship between their countries and establish a global partnership. As leaders of nations committed to the values of human freedom, democracy and rule of law, the new relationship between India and the United States will promote stability, democracy, prosperity and peace throughout the world. It will enhance our ability to work together to provide global leadership in areas of mutual concern and interest.

Building on their common values and interests, the two leaders resolve:

- To create an international environment conducive to promotion of democratic values, and to strengthen democratic practices in societies which wish to become more open and pluralistic.
- To combat terrorism relentlessly. They applaud the active and vigorous counterterrorism cooperation between the two countries and support more international efforts in this direction. Terrorism is a global scourge and the one we will fight everywhere. The two leaders strongly affirm their commitment to the conclusion by September of a UN comprehensive convention against international terrorism.

The Prime Minister's visit coincides with the completion of the Next Steps in Strategic Partnership (NSSP) initiative, launched in January 2004. The two leaders agree that this provides the basis for expanding bilateral activities and commerce in space, civil nuclear energy and dual-use technology.

Drawing on their mutual vision for the U.S.-India relationship, and our joint objectives as strong long-standing democracies, the two leaders agree on the following:

FOR THE ECONOMY

- Revitalize the U.S.-India Economic Dialogue and launch a CEO Forum to harness private sector energy and ideas to deepen the bilateral economic relationship.
- Support and accelerate economic growth in both countries through greater trade, investment, and technology collaboration.
- Promote modernization of India's infrastructure as a prerequisite for the continued growth of the Indian economy. As India enhances its investment climate, opportunities for investment will increase.
- Launch a U.S.-India Knowledge Initiative on Agriculture focused on promoting teaching, research, service and commercial linkages.

FOR ENERGY AND THE ENVIRONMENT

- Strengthen energy security and promote the development of stable and efficient energy markets in India with a view to ensuring adequate, affordable energy supplies and conscious of the need for sustainable development. These issues will be addressed through the U.S.-India Energy Dialogue.
- Agree on the need to promote the imperatives of development and safeguarding the environment, commit to developing and deploying cleaner, more efficient, affordable, and diversified energy technologies.

FOR DEMOCRACY AND DEVELOPMENT

- Develop and support, through the new U.S.-India Global Democracy Initiative in countries that seek such assistance, institutions and resources that strengthen the foundations that make democracies credible and effective. India and the U.S. will work together to strengthen democratic practices and capacities and contribute to the new U.N. Democracy Fund.
- Commit to strengthen cooperation and combat HIV/AIDS at a global level through an initiative that mobilizes private sector and government resources, knowledge, and expertise.

FOR NON-PROLIFERATION AND SECURITY

- Express satisfaction at the New Framework for the U.S.-India Defense Relationship as a basis for future cooperation, including in the field of defense technology.
- Commit to play a leading role in international efforts to prevent the proliferation of Weapons of Mass Destruction. The U.S. welcomed the adoption by India of legislation on WMD (Prevention of Unlawful Activities Bill).
- Launch a new U.S.-India Disaster Relief Initiative that builds on the experience of the Tsunami Core Group, to strengthen cooperation to prepare for and conduct disaster relief operations.

FOR HIGH-TECHNOLOGY AND SPACE

- Sign a Science and Technology Framework Agreement, building on the U.S.-India High-Technology Cooperation Group (HTCG), to provide for joint research and training, and the establishment of public-private partnerships.
- Build closer ties in space exploration, satellite navigation and launch, and in the commercial space arena through mechanisms such as the U.S.-India Working Group on Civil Space Cooperation.
- Building on the strengthened nonproliferation commitments undertaken in the NSSP, to remove certain Indian organizations from the Department of Commerce's Entity List.

Recognizing the significance of civilian nuclear energy for meeting growing global energy demands in a cleaner and more efficient manner, the two leaders discussed India's plans to develop its civilian nuclear energy program.

President Bush conveyed his appreciation to the Prime Minister over India's strong commitment to preventing WMD proliferation and stated that as a responsible state with advanced nuclear technology, India should acquire the same benefits and advantages as other such states. The President told the Prime Minister that he will work to achieve full civil nuclear energy cooperation with India as it realizes its goals of promoting nuclear power and achieving energy security. The President would also seek agreement from Congress to adjust U.S. laws and policies, and the United States will work with friends and allies to adjust international regimes to enable full civil nuclear energy cooperation and trade with India, including but not limited to expeditious consideration of fuel supplies for safeguarded nuclear reactors at Tarapur. In the meantime, the United States will encourage its partners to also consider this

request expeditiously. India has expressed its interest in ITER and a willingness to contribute. The United States will consult with its partners considering India's participation. The United States will consult with the other participants in the Generation IV International Forum with a view toward India's inclusion.

The Prime Minister conveyed that for his part, India would reciprocally agree that it would be ready to assume the same responsibilities and practices and acquire the same benefits and advantages as other leading countries with advanced nuclear technology, such as the United States. These responsibilities and practices consist of identifying and separating civilian and military nuclear facilities and programs in a phased manner and filing a declaration regarding its civilians facilities with the International Atomic Energy Agency (IAEA); taking a decision to place voluntarily its civilian nuclear facilities under IAEA safeguards; signing and adhering to an Additional Protocol with respect to civilian nuclear facilities; continuing India's unilateral moratorium on nuclear testing; working with the United States for the conclusion of a multilateral Fissile Material Cut Off Treaty; refraining from transfer of enrichment and reprocessing technologies to states that do not have them and supporting international efforts to limit their spread; and ensuring that the necessary steps have been taken to secure nuclear materials and technology through comprehensive export control legislation and through harmonization and adherence to Missile Technology Control Regime (MTCR) and Nuclear Suppliers Group (NSG) guidelines.

The President welcomed the Prime Minister's assurance. The two leaders agreed to establish a working group to undertake on a phased basis in the months ahead the necessary actions mentioned above to fulfill these commitments. The President and Prime Minister also agreed that they would review this progress when the President visits India in 2006.

The two leaders also reiterated their commitment that their countries would play a leading role in international efforts to prevent the proliferation of weapons of mass destruction, including nuclear, chemical, biological and radiological weapons.

In light of this closer relationship, and the recognition of India's growing role in enhancing regional and global security, the Prime Minister and the President agree that international institutions must fully reflect changes in the global scenario that have taken place since 1945. The President reiterated his view that international institutions are going to have to adapt to reflect India's central and growing role. The two leaders state their expectations that India and the United States will strengthen their cooperation in global forums.

Prime Minister Manmohan Singh thanks President Bush for the warmth of his reception and the generosity of his hospitality. He extends an invitation to President Bush to visit India at his convenience and the President accepts that invitation.

Appendix B. Indian Nuclear Power Reactors

Power Reactors: Operating				
Name/Location of Facility	**Type and Capacity**	**Date or Target Date of Completion**	**IAEA Safeguards**	**Country of Origin/ Primary Contractor**
Tarapur 1	Light-water, LEU, and/or MOX, 150 MWe	1969	Yes	United States/General Electric Co.
Tarapur 2	Light-water, LEU, and/or MOX, 150 MWe	1969	Yes	United States/General Electric Co.
Rajasthan, RAPS-1 Kota	Heavy-water, nat. U, 90 MWe	1973	Yes	Canada/Atomic Energy of Canada Ltd.
Rajasthan, RAPS-2 Kota	Heavy-water, nat. U, 187 MWe	1981	Yes	Canada/Atomic Energy of Canada Ltd.
Madras, MAPS-1 Kalpakkam	Heavy-water, nat. U, 155 MWe	1984	No	India/Larson & Toubro
Madras, MAPS-2 Kalpakkam (Tamil Nadu)	Heavy-water, nat. U, 202 MWe	1986	No	India/Larson & Toubro
Narora 1	Heavy-water, nat. U, 202 MWe	1991	No	India/NPCIL
Narora 2	Heavy-water, nat. U, 202 MWe	1992	No	India/NPCIL
Kakrapar 1	Heavy-water, nat. U, 202 MWe	1993	No	India/NPCIL
Kakrapar 2	Heavy-water, nat. U, 202 MWe	1995	No	India/NPCIL
Kaiga 1	Heavy-water, nat. U, 202 MWe	2000	No	India/NPCIL
Kaiga 2	Heavy-water, nat. U, 202 MWe	2000	No	India/NPCIL
Rajasthan, RAPP-3 Kota	Heavy-water, nat. U, 202 MWe	2000	No	India/NPCIL
Rajasthan, RAPP-4	Heavy-water, nat. U, 202 MWe	2000	No	India/NPCIL
Power Reactors: Under Construction				
Name/Location of Facility	**Type and Capacity**	**Date or Target Date of Completion**	**IAEA Safeguards**	**Country of Origin/ Primary Contractor**
Tarapur 3	Heavy-water, nat. U, 490 MWe	2007	No	India/NPCIL
Tarapur 4	Heavy-water, nat. U, 490 MWe	2006	No	India/NPCIL
Kaiga 3	Heavy-water, nat. U, 202 MWe	2007	No	India/NPCIL
Kaiga 4	Heavy-water, nat. U, 202 MWe	2007	No	India/NPCIL
Koodankulam 1	Russian VVER-1000/392	2007	Yes	Russia/Russian

	Light-water, LEU 917 MWe			Federation and NPCIL
Koodankulam 2	Russian VVER-1000/392 Light-water, LEU 917 MWe	2008	Yes	Russia/Russian Federation and NPCIL
Rajasthan, RAPP-5 Kota	Heavy-water, nat. U, 202 MWe	2007	No	India/NPCIL.
Rajasthan, RAPP-6 Kota	Heavy-water, nat. U, 202 MWe	2008	No	India/NPCIL.
Power Reactors: Planned and Proposed				
Name/Location of Facility	Type and Capacity	Date or Target Date of Completion	IAEA Safeguards	Country of Origin/ Primary Contractor
Kaiga 5	Heavy-water, nat. U, 700 MWe	-	No	India
Kaiga 6	Heavy-water, nat. U, 700 MWe	-	No	India
Rajasthan, RAPP-7 Kota	Heavy-water, nat. U, 700 MWe	-	No	India
Rajasthan, RAPP-8 Kota	Heavy-water, nat. U, 700 MWe	-	No	India
Breeder Reactors				
Name/Location of Facility	**Type and Capacity**	**Date or Target Date of Completion**	**IAEA Safeguards**	**Country of Origin/ Primary Contractor**
Fast-Breeder Test Reactor (FBTR), IGCAR Kalpakkam	Plutonium and nat. U, 40 MWt	1985	No	India/Indira Gandhi Center for Atomic Research
Prototype Fast-Breeder Reactor (PFBR), IGCAR Kalpakkam	Mixed-oxide (MOX) fuel, 470 MWe, excavation work began in 2003	2009	No	India/Indira Gandhi Center for Atomic Research

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About the Author

Admiral (Retired) Raja Menon pioneered submarines in the Indian Navy and retired as the Assistant Chief of the Naval Staff (Operation) in 1994. A former senior Fellow at the Institute for Defence Studies and Analyses, New Delhi, Admiral Menon has authored several books including *Maritime Strategy and Continental Wars* (this book is now a standard text in the Indian Navy), *A Nuclear Strategy for India*, and *The Indian Navy: A Photo Essay* (produced for the Navy and is now the official gift). His book *Weapons of Mass Destruction: Options for India* was published in 2004.

Admiral Menon is engaged in a number of track II missions with Pakistan and was on the Arun Singh Committee for restructuring the management of defense. He was on the committee to establish a National Defence University in India. He is also a consultant to the Indian Navy on strategic studies and the refurbishment of the National Maritime Museum. He is a member of the Indo-US Net Assessment Group and conducted the country's first course on Nuclear Operations Management for service officers.

While at Sandia National Laboratories, from June 9 through August 25, 2005, Admiral Menon explored what India and the US could do to strengthen India's role in nonproliferation and implement the agreement signed by President Bush and Prime Minister Manmohan Singh on bridging the nuclear divide.

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